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## ARM Facilities Newsletter

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## North Slope of Alaska CART Site



A goal of the ARM Program is to improve scientific understanding of the interactions of sunlight (solar radiation) with the atmosphere, then incorporate this understanding into computer models of climate change. To model climate accurately all around the globe, a variety of data must be collected from many locations on Earth.

For its CART sites, ARM chose locations in the U.S. Southern Great Plains (SGP), the North Slope of Alaska (NSA), and the Tropical Western Pacific Ocean to represent different climate types around the world. This month we consider the NSA CART site, with locations at Barrow and Atqasuk, Alaska (Figure 1).

Barrow lies 10 miles south of the northernmost point in the United

States and is 330 miles north of the Arctic Circle (Figure 2). The climate of Barrow is classified as arctic. Air temperatures can range from -56°F to 78°F, and they average about 40°F during the summer months. Because of the far northern location, the sun does not set between May 10 and August 2 each summer. In contrast, the sun does not rise between November 18 and January 24 every winter. Daily low temperatures are below freezing on 324 days of the year. Annual snowfall totals 20 inches, and liquid precipitation averages 5 inches per year. So why would ARM select such a place for a CART site?



Figure 1. North Slope of Alaska CART site locations.

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The Arctic is very sensitive to climate change and provides a unique environment in which to study the interaction of clouds and solar radiation. Water is found mostly in its frozen states of snow and ice during



Figure 2. A view from the NSA CART site at Barrow on April 24, 2000.

much of the year. Sunlight and radiant heat are scattered, transmitted, and absorbed much differently by ice and snow crystals than by water vapor and water droplets. In addition, the low concentration of water vapor in the atmosphere might affect the propagation of radiant energy.

Data must be collected at high latitudes so that comprehensive climate modeling programs can be developed and tested. Weather and climate are distinctly different at various locations around the globe, and yet they are interdependent. Getting correct and useful results from computer simulations of Earth's climate requires as much accurate input data as possible.

The CART site in Alaska was dedicated in 1997. Many of the types of instruments found at the SGP CART site are also used in the cold arctic climate at the NSA site. Measurements of cloud, solar radiation, surface meteorological, and atmospheric profiling parameters are made with instruments that have been engineered to operate in and withstand the severe weather conditions at high northern latitudes.

The NSA CART site location at Atqasuk lies near the local airport (Figure 3). This site is outfitted with two suites of radiometric instrumentation that are used to measure upwelling infrared (heat) radiation and downwelling solar radiation.

At the NSA CART site, scientists hope to learn more about the way solar radiation travels through an atmosphere that is very cold, the way radiation interacts with clouds or with the cloudless atmosphere, and the interactions between sky and land surfaces that are bare or covered with ice and snow. The transfer of infrared radiation from the land to the sky in various conditions will also be a topic of investigation, because the Arctic offers many extreme conditions that are not found at the SGP site.



Figure 3. An aerial view of the Atqasuk field site at the North Slope of Alaska.